Results of Reconnaissance Sampling for Juvenile Salmonids in the Upper Fraser River and Selected Tributaries, August and October, 1984

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by

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ABSTRACT

C. D. Levings, J. C. Scrivener, B. Andersen, C. Shirvell and R. Lauzier. 1985. Results of reconnaissance sampling for juvenile salmonids in the upper Fraser River and selected tributaries, August and October, 1984. Can. Data Rep. Fish. Aquat. 549: 27 p.

Results are presented from qualitative reconnaissance sampling of juvenile salmonids and habitats in the upper Fraser River basin, above Hope, in August and October, 1984. The following rivers were visited: Nicola, Coldwater, Bessette Creek system, Deadman River, Thompson River at Savona, Lemieux Creek, Fraser River at Williams Lake and Marguerite, Hawk Creek, Stone Creek, Nechako River, and Bowron River. Length and stomach content data are presented on small samples of juvenile coho (Oncorhynchus kisutch) and chinook (O. tshawytscha). In the August sampling, temperatures appeared to be a major factor influencing salmonid distribution.

Key words: Fraser River, habitats, juvenile salmonids, reconnaissance

RESUME

C. D. Levings, J. C. Scrivener, B. Andersen, C. Shirvell and R. Lauzier. 1985. Results of reconnaissance sampling for juvenile salmonids in the upper Fraser River and selected tributaries, August and October, 1984. Can. Data Rep. Fish. Aquat. 549: 27 p.

Les résultats présentés proviennent d'un échantillonnage de reconnaissance qualitatif de jeunes salmonidés et de leurs habitats dans le bassin supérieur du Fraser, en amont de Hope, en août et octobre 1984. Les rivières suivantes ont été visitées: la Nicola, la Coldwater, le réseau du ruisseau Bessette, la rivière Deadman, la rivière Thompson à Savona, le ruisseau Lemieux, le Fraser à Williams Lake et à Marguerite, le ruisseau Hawk, le ruisseau Stone, la rivière Nechako et la rivière Bowron. Les données sur le contenu stomacal et la longueur sont présentées pour de petits échantillons de jeunes saumons coho (Oncorhynchus kisutch) et de jeunes saumons chinook (O. tshawytscha). Pendant l'échantillonnage du mois d'août, les températures ont semblé influer beaucoup sur la distribution des salmonidés.

Mots-clés: Fleuve Fraser, habitats, jeunes salmonidés, reconnaissance

INTRODUCTION

Reconnaissance trips to selected locations in the Fraser River system above Hope were conducted to obtain an overview of salmon habitat issues in the drainage basin. Habitats of juvenile coho and chinook in streams and rivers were the focus of the investigations. There are several major and numerous minor developments that could be affecting salmon production in freshwater, but their interactive or cumulative effects are not being considered in the Fraser. Some examples include the interaction of railway twin tracking, highway construction, and water withdrawal which is usually not thought of, nor is the distribution of contaminants from Upper Fraser pulp mills considered with respect to the impact of sewage in the lower river. The reconnaissance observations were also used for preparing a research proposal for expanding work to study these problems more comprehensively. Many of the sites visited have been sampled more thoroughly by previous workers, but certain of them appear to have not been examined at all and hence the data here may be of local interest.

METHODS

Sampling methods were qualitative or semi-quantitative and included pole seining, beach seining, electrofishing, and visual observations. Information on seine dimensions and electrofishing apparatus are given in Table 1. Temperature measurements were obtained using a hand-held thermometer. Photographs were taken of most sampling stations. Macroinvertebrates were collected at some locations.

SYSTEMS SAMPLED

Figure 1 and Tables 2 and 3 show the rivers and streams sampled and dates when they were visited. The following subbasins were examined in widely varying degrees of thoroughness: Nicola, Bessette, Deadman, North Thompson, Fraser mainstem between Williams Lake and Prince George, Nechako, and Bowron.

RESULTS AND DISCUSSION

A. Nicola River (August 7, 9) (Figure 2)

Four sites were sampled on the mainstream Nicola River, ranging from a station near the river's confluence with the Thompson to a location just below Nicola Lake. Nicola 1, the lower site, produced mainly cyprinids and suckers. Two chinook fry (45 mm) were obtained by pole seine at the base of a riffle in

the mainstem. Macroinvertebrate particle collectors such as chironomids, caddisflies and simulids were attached to the rocks in the riffles. A small irrigation side channel, stagnant with thick vegetation, yielded only cyprinids, primarily dace fry. Water temperatures ranged from 19.5 to 21.5°C in the river and side channels. Nicola 2, just below a canyon, was difficult to sample because of the presence of deep pools and large boulders. No fish were obtained at this site. Water temperature was 19.0°C at 1600 hrs. Nicola 3 was about 5 km below Merritt adjacent to the Neale Brothers Ranch. Four coho fry (50 to 60 mm) were obtained at the base of a riffle, while cyprinids dominated catches in a small embayment on the south side of the river. No fry were observed in an irrigation ditch which led off this embayment. Pole seining and shocking was used in the main stem river at Nicola 4 (deep pool, steep riffle) but only sculpins were obtained. Water temperature was 19.5°C at 0900 hrs on August 9. However at the mouth of Clapperton Creek, 20 m away, where water temperatures were 11.0 to 12.5°C a small school of both coho (26) and chinook (21) was sampled. Clapperton Creek was almost completely dry, but ground water appeared to be percolating to the surface near the confluence with the Nicola.

B. Coldwater River (August 8) (Figure 2)

Coldwater 1 was a location adjacent to the town of Merritt campground, on a road off the river which was protected by riprap. Rainbow trout fry were the most abundant salmonid at this site, especially in the riffles beside the campground. Stream temperatures ranged from 17 to 20°C. Coho fry were obtained under woody debris trapped on larger rocks. Six lamprey ammocoetes were caught while electrofishing. Coldwater 2 was in pool habitat at the base of an extensive riffle zone below the Patchett Road Bridge. Eighteen coho fry were taken in these pools, primarily under cutbanks and under a large poplar stump. Coldwater 3 was a site downstream and under the bridge at Kingsvale. Fish populations consisted mainly of rainbow trout. Electrofishing was conducted in Voght Creek, within 100 m of the confluence with the Coldwater. A single coho and trout fry were caught in the shallow pools at the mouth of this creek. The stream was 19.5°C at 1500 hrs. Coldwater 4 was a site very close to the highway and the lefthand bank of the river was characterized by extensive riprap. A few coho fry were taken by beach seine here. Coldwater 5 included both on and off channel habitats. Coho fry were most abundant in beaver ponds and pools. Completely isolated pools as small as 2 x 1 x 1 m were sampled and found to contain fry up about 80 mm in length. Water temperatures were 13.0 - 13.5°C in these areas, while they were 17.0°C upstream at Coldwater 6 earlier in the morning. Coldwater 6 included sampling in Mine Creek and the mainstem Coldwater. Coho fry were found in the plunge pool of Mine Creek (12.0°C) downstream of the culvert under the newly constructed highway. On the Coldwater smaller coho fry were abundant in partially isolated side channels (with older beaver dams) downstream from the junction with Mine Creek, on the west side of the river. One was a groundwater-fed site which was 8.0°C at its source. Brookmere 1 was about 4 km from the village of Brookmere in Brook Creek. The stream was almost completely overgrown with vegetation and was very narrow (2 m wide) and shallow (<10 cm deep). Only rainbow trout were caught here. The creek temperature was 16.5°C at this site. Macroinvertebrates in the Coldwater River consisted mostly of scrapers, shredders and detrital feeders. Flatheaded mayflies which scrape algae from the rocks or ingest leaf detritus were very common. Large caddisflies and stonefiles which shred vegetative detritus were also numerous. Chironomids were also common, but filter feeders in general were less numerous than in the Nicola River.

During August 1984, salmonids in the Nicola - Coldwater basins tended to be more numerous in areas that were influenced by cooling groundwater. During the afternoon water temperatures tended to be near the upper preferred level for salmonids especially in the Nicola River. The areas which are influenced by groundwater should be noted and they should be recognized as high priority habitat. These sites in the upper Coldwater are probably warmer than the main river during the winter. Low water levels and temperatures, ice cover and ice scour are known to limit production in interior streams during the winter (Bustard 1985); these areas would remain ice free longer. Studies on coastal streams have indicated that groundwater inputs keep water tempertures cooler in summer and warmer in winter (Hartman and Leahy 1983).

C. Bessette Creek System (August 9) (Figure 3)

A number of sites were sampled on Bessette Creek and several tributary streams. Air temperatures on August 9 were estimated 30°C. Stream temperature was accordingly high at all locations sampled and ranged from 19 to 21°C.

Duteau Creek was sampled at 2 locations. The first site was at the road bridge est. 0.5 km from highway No. 6 and est. 300 m below the confluence of Lawson and Duteau Creeks. Habitat here was pool and riprap. One pole seine in the tail of a pool caught 27 coho and 7 rainbow trout. Electrofishing yielded 5 coho and 9 trout and several cottids and cyprinids. An upstream site, on Headgate Road, was much steeper gradient with boulders. Here, 15 rainbow trout were caught by electrofishing.

Seven pole seines were obtained downstream of the second main road bridge over Bessette Creek above Lumby. Pool habitat under the bridge and riffle areas lined by riprap were sampled. A total of 51 coho and 16 trout were obtained.

Two sites were sampled on Creighton Creek. The lower station, just above the bridge at the second crossing on Creighton Valley Road was sampled with 5 pole seines. Pool and riffle habitat (est. 2 m wide) had some cutbanks and overhanging willow cover. Nine coho and 6 rainbow trout were caught. The upper Creighton site was at the third crossing on Creighton Valley Road in a heavily channelized riprap (on both sides of the stream) area characterized by riffles (est. 1.5 m wide). Seven pole seine sets caught 7 rainbow trout.

Bessette Creek was sampled about 5 km below Lumby at the residence of Mr. D. Ainsworth. The Creek was about 3 m wide with a gravel bar on the west side and a fairly steep cutbank on the opposite shore. A very small (est. 20 cm wide) groundwater tributary leading from two dug ponds were sampled here. There was considerable temperature difference between the tributary (17°C) and Bessette Creek (21°C). Six pole seine sets were made along the gravel bar of the Creek. Seventy-five out of the 81 coho fry caught were in the sixth set, at the mouth of the tributary. Eighteen coho were caught in 2 sets in the tributary itself.

The macroinvertebrates in these watersheds consisted mainly of mayflies and chironomids. Flatheaded mayflies were very numerous in the riffles, while large caddisflies were common in the pools. Many stoneflies and predaceous chironomids were sampled. The invertebrate community appeared larger than that of the Nicola/Coldwater system.

D. Deadman River (August 10) (Figure 4)

Five sites on the Deadman River were sampled for fish, ranging from the lower reaches of the river, just below the No. 1 Highway bridge to the headwaters at Mowitch Lake. Deadman 8 was a site in boulder/riffle habitat, about 2 km below the Skyhigh Lake road turnoff. Four chinook and 5 rainbow trout were taken here by electrofishing. The next site downriver, which was at the junction of the Deadman River and Tobacco Creek, was sampled with pole seine and shocker; only rainbow were taken. Site 6, in a low gradient reach of the river, was sampled by electrofishing under logs and cutbanks. One chinook and 9 trout were caught. Site 5 was below the BCFW fry trapping site at the Phillips Ranch. Four coho, 5 chinook, 8 trout and 4 lamprey ammocoetes were caught under cutbanks at this site, which was at the base of the glide. Criss Creek, one of the major tributaries of the Deadman, was sampled by electrofishing at a bridge about 3 km upstream of the junction with the Deadman. Fourteen trout were obtained. Site 4 was in the Deadman River about 0.5 km below the confluence of Criss and Deadman Creeks. Five pole seines yielded 13 trout fry, while 4 coho fry were caught by electofishing. Both riffle and pool habitat was sampled at this site. Seven pole seines were taken at the lowest-most site sampled, (est. 0.5 km below the Highway No. 1 bridge), both below and above the adult fence that was in the river at the time. No juvenile salmonids were obtained.

A rich fauna of macroinvertebrates also existed in the Deadman System. Flathead and roundhead mayflies and stoneflies were very common. Caddisflies and blackflies numbers were quite variable among the sample sites.

E. Thompson River (August 11)

Six beach seines were taken on the south shore of the Thompson River 0.5 - 1 km below the No. 1 highway bridge at Savona. One coho, 27 chinook, 14 sockeye fry and several hundred cyprinids were obtained.

F. Fraser River (August 11, 12; October 25) (Figure 5)

Five general locations were sampled on the mainstem river between the Highway 20 bridge (just below Williams Lake) and Prince George. Three sites were on the mainstem river, and two were small tributaries.

The site near the Highway 20 Bridge was in a shallow lagoon about 0.1 ha in area, on the west side of the river, approximately 3 km upstream from the bridge. The substrate consisted of sand with rock outcrops. Two beach seines, covering almost all of the pool, were obtained for a total catch of 27 chinook fry. Redside shiners, suckers, and squawfish were far more abundant (Table 2).

Hawk Creek, which joins the Fraser about 15 km north of Williams Lake, was supporting a very large population of chinook fry in August. The stream was about 1 m wide at this time. Sampling was below a waterfall which ran over a demolished concrete bridge about 2 km from the Fraser. Pools (up to 50 cm deep) and deep riffles (est. 10 cm) were sampled with pole seines, yielding 396 chinook in 17 seines. Little difference in temperature was observed at the time (Hawks = 16.5°C; Fraser = 18.5°C), but the Fraser River carried its usual high silt load, while Hawk Creek was clear. An off channel irrigation pool was observed just above the road bridge. However an intake was placed in the stream, not in the pool.

On October 25 1984 when Hawk Creek was resampled a major freshet was in progress and sampling was difficult. Many fewer chinook were caught at this time (2 in 12 pole seines).

Four beach seines were obtained at the Marguerite ferry sites on August 12, 3 on the east side (upstream of the ferry) and 1 on the west side of the Fraser (downstream of the ferry). Twenty chinook were caught in the east side seines. The west site was sampled by pulling the seine through a shallow channel (< 1 m deep), approximately 80 m long and 30 m wide. Thirty-seven chinook were caught, as well as several hundred squawfish and suckers.

Stone Creek (August 12) between Quesnel and Prince George, appeared to be a similar habitat to Hawk Creek. Chinook fry were almost as abundant, and 114 were taken in 7 pole seines from the Highway 97 bridge to the confluence with the Fraser. Three beach seines were taken at the mouth of the creek, yielding 27 chinook fry. Temperatures varied from 19.0°C at the mouth to 16.0°C at 100 m up the tributary.

G. Nechako River and Tributaries (August 13) (Figure 5)

Sampling on the Nechako took place on a drive from Vanderhoof to the Kenney Dam. Four locations were sampled en route. The first tributary sampling was Greer Creek, where 4 pole seines were taken within 100 m upstream of the road bridge. No salmonids were taken. Two beach seines were obtained near the mouth of Greer Creek, at the Forestry Camp Road. The Nechako River was high at this time and seines were pulled onto the bank into riparian vegetation. Six chinook were taken in the 2 hauls. Swanson Creek was sampled next, with 3 pole seines within 50 m upstream of the road bridge. Seven rainbow trout were obtained. A very small tributary (est. 5 m wide, depth <10 cm) near the entrance to Bert Irvine's Ranch was sampled with 7 pole seines. The seines were taken at approximately equal distances from the mouth and upstream to about 80 m. Water temperature in this creek was 10.5°C compared to 15.5°C in the main stem Nechako. Twenty-five chinook and 3 coho fry were caught.

Coho have not been reported in the Nechako drainage before and so those 3 fish identified as coho were checked in the laboratory. Pyloric caeca counts confirmed these fish as coho. However, a collection of spawners would be highly desirable for positive identification. Coho have been recorded in another Upper Fraser tributary, namely the Quesnel (Marshall and Manzon 1980; Scott and Crossman 1973).

H. Bowron River (August 14) (Figure 6)

The majority of the sampling on the Bowron River and tributary took place at the junction of the Haggen Creek and Bowron River at the Forest Service campsite location est. 50 km south of Highway 16. Seven pole seines were taken in Haggen Creek from the confluence to the riprap under the bridge. Two chinook were obtained. Electrofishing in this area yielded 5 chinook and 2 rainbow trout. Four pole seines in the Bowron River just above the confluence caught only a few cottids. Electrofishing caught 2 chinook, in riprap and wood debris habitat.

Wendell Creek just below the logging road bridge was sampled by electrofishing, yielding 8 rainbow trout. Hah Creek was sampled with 3 pole seines in pools at the bases of riffles. No fish were caught.

I. Lemieux Creek (tributary to North Thompson) (October 4,5 1984) (Figure 7)

Pole seining was used exclusively for this sampling and 7 stations were covered (Table 3). Fish were measured after being anaesthetized with MSS 222. Except for Station 1, at the uppermost bridge on the stream, side channel and pool habitats were sampled. At Station 1 sampling under cutbanks and deeper pools was performed. Coho and rainbow were the only fish taken in the survey. More rainbow were taken in the upper reaches of the Creek. Mean length of coho ranged from 50 to 60 mm, while rainbow were 49 to 65 mm.

J. Fish Lengths and Stomach Analyses

Small subsamples of chinook, coho and rainbow trout were collected for length measurements and examination of stomach contents. Coho fry were smaller in the Coldwater (mean length approximately 48 mm) compared to the Bessette Creek system (mean approximately 52 mm). Chinook fry in tributaries (Hawk and Stone Creek) were smaller than in the Fraser mainstem (mean length 58 mm compared to 72 mm; Table 4).

Forty-three chinook stomachs were examined to determine feeding habits, and the frequency of occurence of prey items is shown in Table 5. Chironomid larvae were found in almost half the stomachs. The next most frequently occurring items were hymenoptera larvae and nematodes. Chironomid larvae were found in chinook salmon ranging from 37 to 83 mm length. Hymenoptera larvae were found in individuals ranging from 60 to 74 mm, and Hymenoptera adults in individuals from 64 to 90 mm.

There were a few noteworthy items in the stomach analysis. The two smallest chinook (39 mm, 37 mm) were caught at Hawk Creek, with extremely full guts of chironomid larvae exclusively. Two chinook fry (72 mm and 73 mm) caught at the mouth of Clapperton Creek on the Nicola River had full guts of gammaridean amphipods, exclusively. An adult honeybee (Apidea) was found in an individual (70 mm) caught in the Stoner Creek. Another individual (60 mm) from the same area ingested an adult snout beetle (Curculionidae).

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Table 1: Equipment used in the upper Fraser River reconnaissance trip.

Pole seine:	1.2 by 2.5 m marquissette net (3 mm stretch mesh) with lead, cork lines and aluminum poles
Beach seine:	14.7 m with wings 4.7 m (1 cm stretch mesh); bunt 4.9 m (5 mm stretch mesh); depth 3 m.
Electrofishing:	Smith/Root fish electroshocker Model No. VIII A modified cathode pole with magnetic reed switch
Photographs:	Slides and color prints were taken with Asahi pentax 1:2/55 mm lens camera.
Macroinvertebrates:	Collected by kick sampling or Surber sampler; all identifications were done in the field.

Table 2. Fish captured by all methods during the Fraser reconnaissance sampling conducted.

Location & Method (PS-Pole seine) (BS-Beach seine) (ES-Electro fishing)	Dates (Aug/84)	No. of Stations	No. of sets and/or secs of shocking	T(°C) Range	Number of fish caught									
					Coho	Chinook	Rainbow trout	White-fish	Redside shiner	Suckers	Squaw fish	Cottids	Lamprey (Lampetra tridentata)	Others
Nicola R. PS, ES	7,9	4	34 sets[1]	17-22	4	2	0	0	0	0	29	29	0	>200 cyprinids
Coldwater BS,PS,ES	7,8	6	39 PS, 2 BS 370 ES secs	12-20.5	156	0	49	9	0	0	0	0	7	1 Dolly Varden
Brook Ck PS	8	1	3 PS	16.5	0	0	57	0	0	0	0	0	0	
Voght Cr	8	1	ES	16.5	1	0	1	0	0	0	0	0	0	
Mine Ck PS	8	1	8 PS	12.0	23	0	0	0	0	0	0	0	0	1 Dolly Varden
Clapperton Ck PS	9	1	3 PS	11-12.5	26	21	0	0	0	0	0	0	0	
Duteau Ck PS,ES	9	2	1 PS 290 ES secs	18-19.5	32	0	31	3	0	0	0	5	0	22 cyprinids
Creighton Ck PS	9	2	12 PS	15.5-18.0	9	0	14	0	0	0	0	0	0	
Bessette Ck PS,ES	9	2	15 PS 123 ES secs	17-21	150	0	17	1	0	0	0	0	0	
Deadman R. PS, ES	10	7	16 PS 994 ES secs	14-19	9	11	64	0	0	0	0	15	6	1 cyprinids 2 dace
Criss Ck ES	10	1	140 ES secs	18.5	0	0	14	0	0	0	0	0	0	
Thompson R BS	11	1	6 BS	15.5	1	27	0	0	0	0	0	3	0	>500 cyprinids; 14 sockeye
Hawk Ck PS	11	1	17 PS	16.5	2	396	7	3	2	2	0	0	0	

Table 2. (Cont'd)

Location & Method (PS-Pole seine) (BS-Beach seine) (ES-Electro fishing)	Date (Aug/84)	No. of Stations	No. of sets and/or secs of shocking	T(°C) Range	Number of fish caught									
					Coho	Chinook	Rainbow trout	White-fish	Redside shiner	Suckers	Squaw fish	Cottids	Lamprey (Lampetra tridentata)	Others
Fraser R	11													
Chilcotin Br. BS, PS	11	1	2 BS, 2 PS	18.5	0	27	0	3	95	38	13	0	0	
Marguerite BS	12	2	4 BS	18.5	0	62	0	0	14	187	64	0	0	30 cyprinids
Stone Ck mouth BS	12	1	3 BS	19.0	0	27	0	1	22	4	3	0	0	
Stone Ck PS	12	1	7 PS	16-19	0	114	0	0	1	0	5	0	0	
Nechako R. PS, BS	13	1	2 BS 1 PS	15.5	0	8	0	2	1	5	3	1	0	
Greer Ck PS	13	1	4 PS	16.5	0	0	0	0	0	0	0	0	0	2 cyprinids
Swanson Ck PS	13	1	3 PS	14.5	0	0	7	0	0	0	0	0	0	
Nechako trib. PS	13	1	7 PS	10.5-14.3	3	21	8	0	0	0	0	0	0	
Haggan Ck PS, ES	14	1	7 PS 146 ES secs.	12.0	0	7	0	0	0	0	0	1	0	
Wendell Ck ES	14	1	170 ES secs.	12.5	0	0	8	0	0	0	0	0	0	
Hah Ck PS	14	1	3 PS	10.5	0	0	0	0	0	0	0	0	0	
Bowron R PS, ES	14	1	4 PS 154 ES secs	14	0	2	0	0	0	0	0	6	0	1 ling

1 no data available on electrofishing time

Table 3. Pole seine catches and fork length of coho and rainbow trout in Lemieux Creek, October 4, 5, 1984. Unless indicated, all fish measured from samples

Site	No. Coho	Mean length	No. rainbow	Mean length	Comments
1	102	60.0±7.9	31	65.0±21.1	55m upstream of bridge; T=9.8°C. 3 sets.
2	47*	58.8±6.5	-		pools and side channels.
3	21	55.0±4.6	-		all side channel habitat.
4	26	56.7±5.7	-		sidechannel at roadside. Close to mouth of Eakin Creek.
5	18	50.4±9.5	1	53	Sidechannels upstream of Eakin Creek mouth. T=10.0°C.
6	-	-			est. 150 m upstream into Nehalliston Creek. Fry observed in deep pool with log debris.
7	7	53.6±3.7	29	49.1±0.5	est. 100 m upstream of confluence with Nehalliston Creek. Pool, riffle, sidechannels.
8	31	56.6±7.7	-		Fish caught in side channel habitat only.

footnote

[1]Indicates 22 fish measured

Table 4. Mean length of salmonids retained during upper Fraser reconnaissance conducted during August 1984.

Location	CHINOOK		COHO		RAINBOW TROUT			
	No. retained	Mean F.L. (mm)±S.D.	No. retained	Mean F.L. (mm)±S.D.	No. retained	Mean F.L. (mm)±S.D.		
Coldwater#1	n.c.[1]		0	-	6	30±3		
Coldwater#2	n.c.		3	60±13	3	34±2		
Coldwater#3	n.c.		2	37±	0			
Coldwater#4	n.c.		5	36±8	0			
Brookmere#1	n.c.		n.c.		4f[2]	34±4;	3 y[3]	75±1.1
Mine Ck	n.c.		2	60±26	0			
Clapperton Ck	n.c	80±07	n.c.	76±6	n.c.			
Duteau#1	n.c.		4	54±9	6f	32±2;	1 y	89
Bessette 1	n.c.		5	55±3	3f	46±4;	1 y	72
Bessette 2	n.c.		6	48±9	0			
Deadman#8	4	75±11	n.c.		0			
Deadman#7	n.c.		n.c		4f	44±8;	1 y	103
Deadman#6	1	83	n.c.		3	39±7		
Deadman#5	0		4	60±10	0			
Deadman#4	n.c.		4	60±7	0			
Thompson R.	5	73±11	1	66	0			
Hawk Ck u/s bridge	8	62±17	n.c		0			
Hawk Ck d/s bridge	2	52±09	1	47	n.c.			
Chilcotin Bridge	5	73±05	n.c.		n.c.			
Marguerite#1	6	63±11	n.c.		n.c.			
Marguerite#2	0		n.c.		n.c.			
Fraser R. at Stone Ck	5	79±09	n.c.		n.c.			
Stone Ck	6	61±07	n.c.		n.c.			
Nechako R.#1	3	82±05	n.c.		n.c.			
Nechako tributary	0		3	59±6	0			
Haggen Ck	7	63±08	n.c		n.c.			
Total	58		50		35			

[1] indicates none caught.
[2] indicates fry
[3] indicates yearling

Table 5. Frequency of common prey items in chinook stomachs captured from the Fraser River system during August 1984.

	Chironomid larvae	Larvae Hymenoptera	Adult Hymenoptera	Nematodes	Adult Hemiptera	Diptera	Insect cases	Larval fish	Amphipods
No. of stomachs in which prey item was found	20	13	4	13	4	2	2	1	2
% occurrence	46.5	30.2	9.3	30.2	9.3	4.6	4.6	2.3	4.6

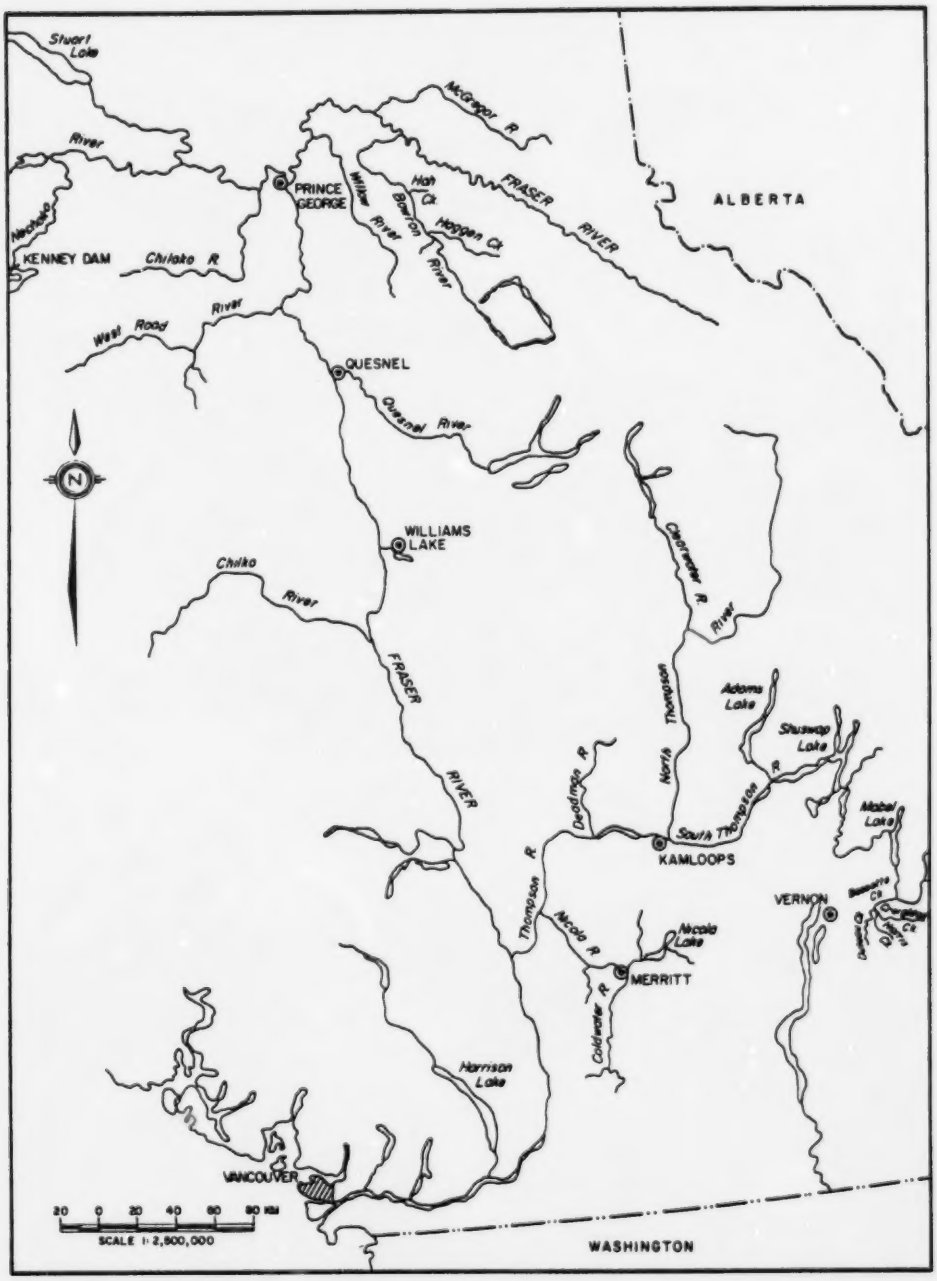

Fig. 1. Map of the Fraser River drainage basin showing river systems visited and major locations.

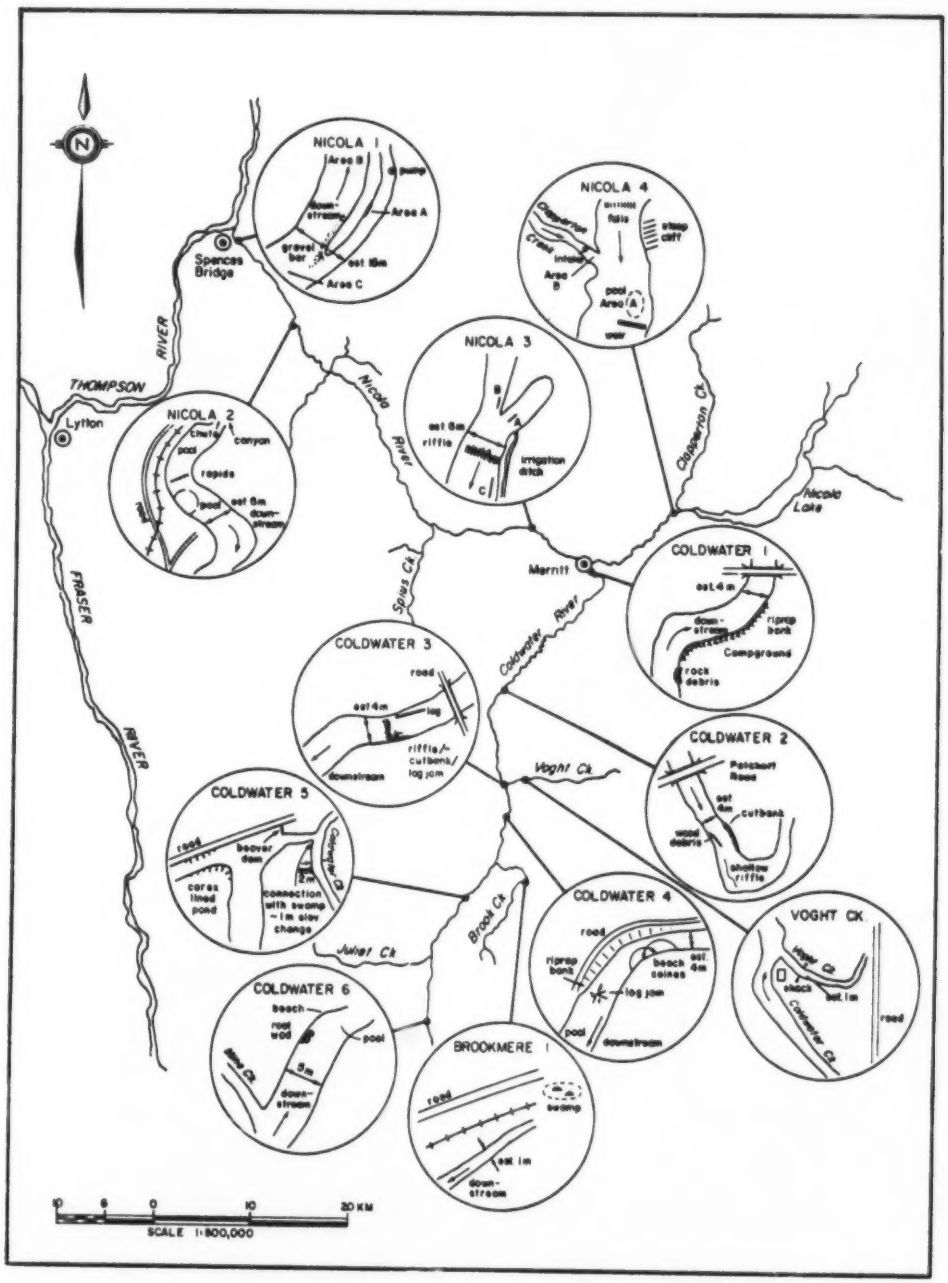

Fig. 2. Map of the Nicola and Coldwater River basins showing sites visited August 7, 8 and 9, 1984.

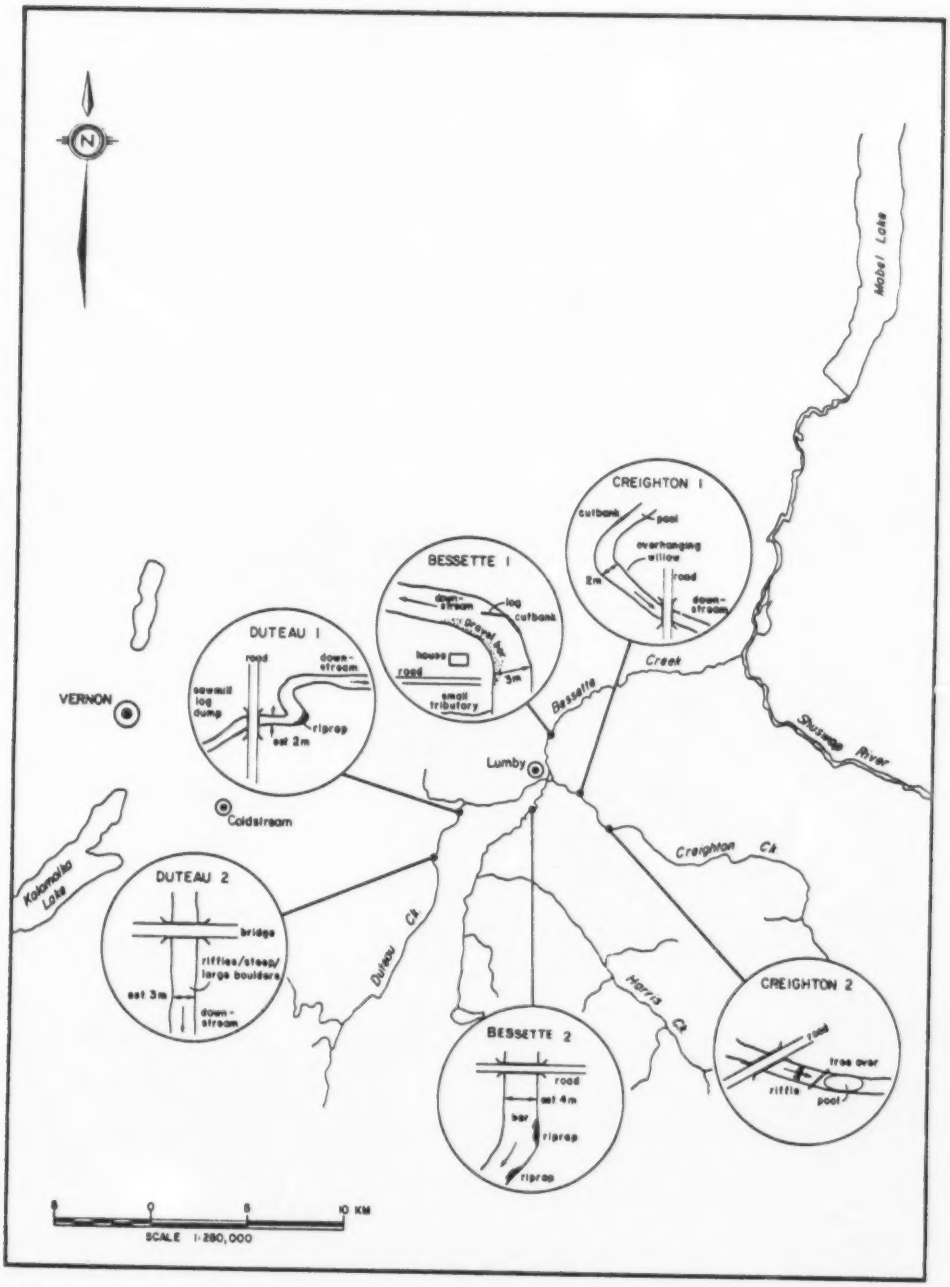

Fig. 3. Map of the Bessette Creek basin showing sites sampled August 9, 1984.

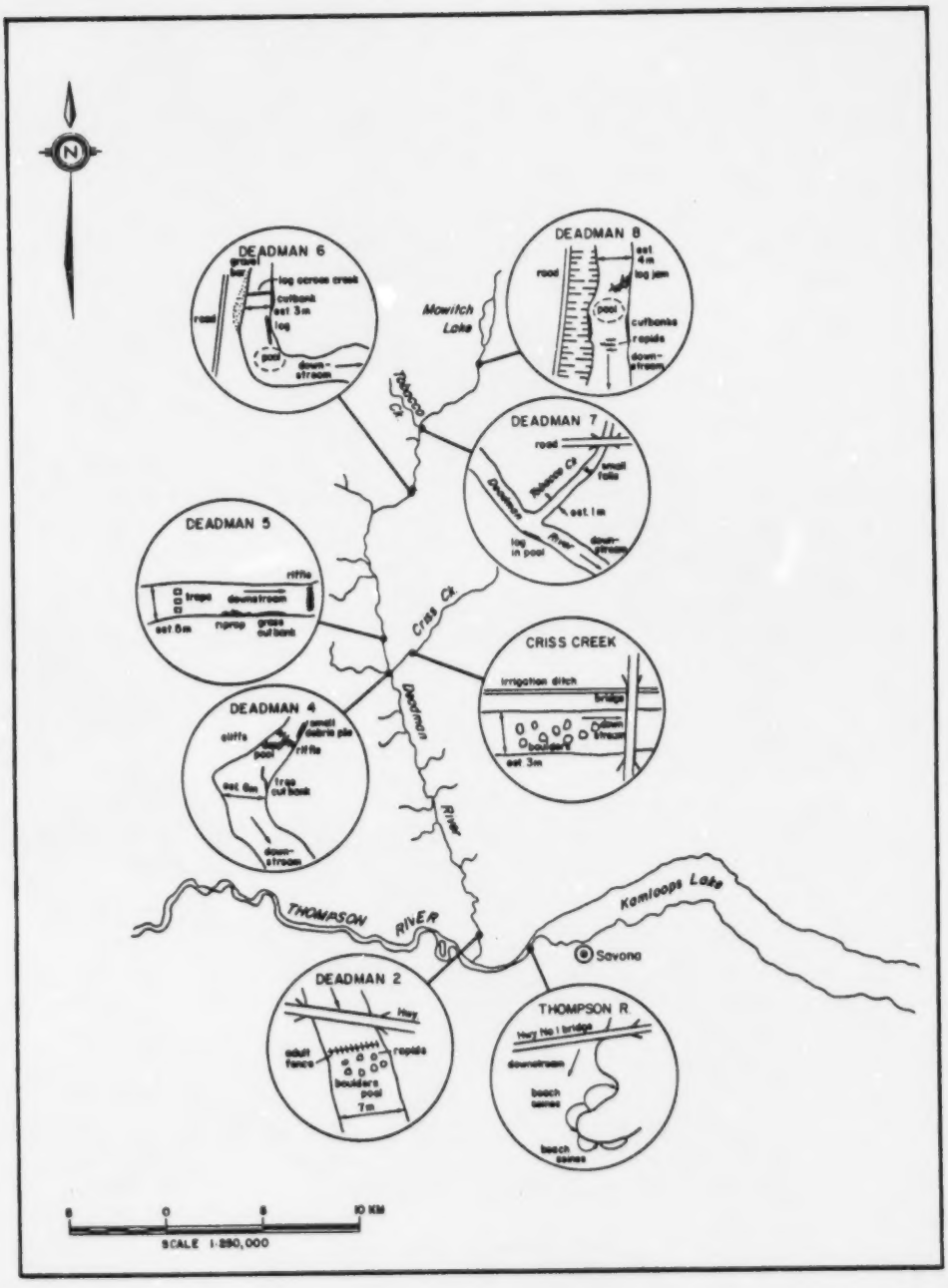

Fig. 4. Map of the Deadman River system and the upper Thompson River sampling sites visited August 10 and 11, 1984.

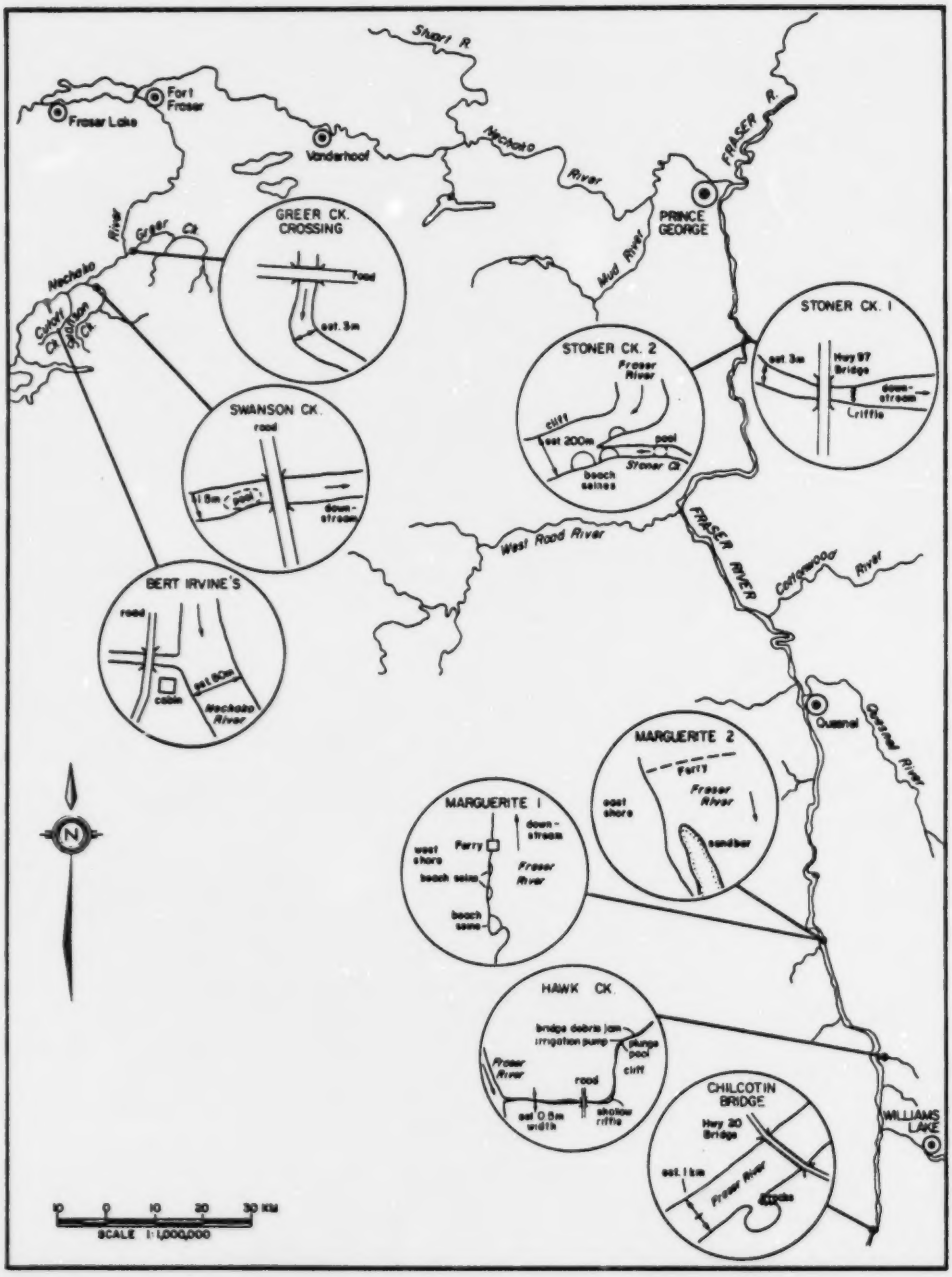

Fig. 5. Map of the mainstem Fraser River and Nechako River showing sites visited August 11, 12, and 13, 1984.

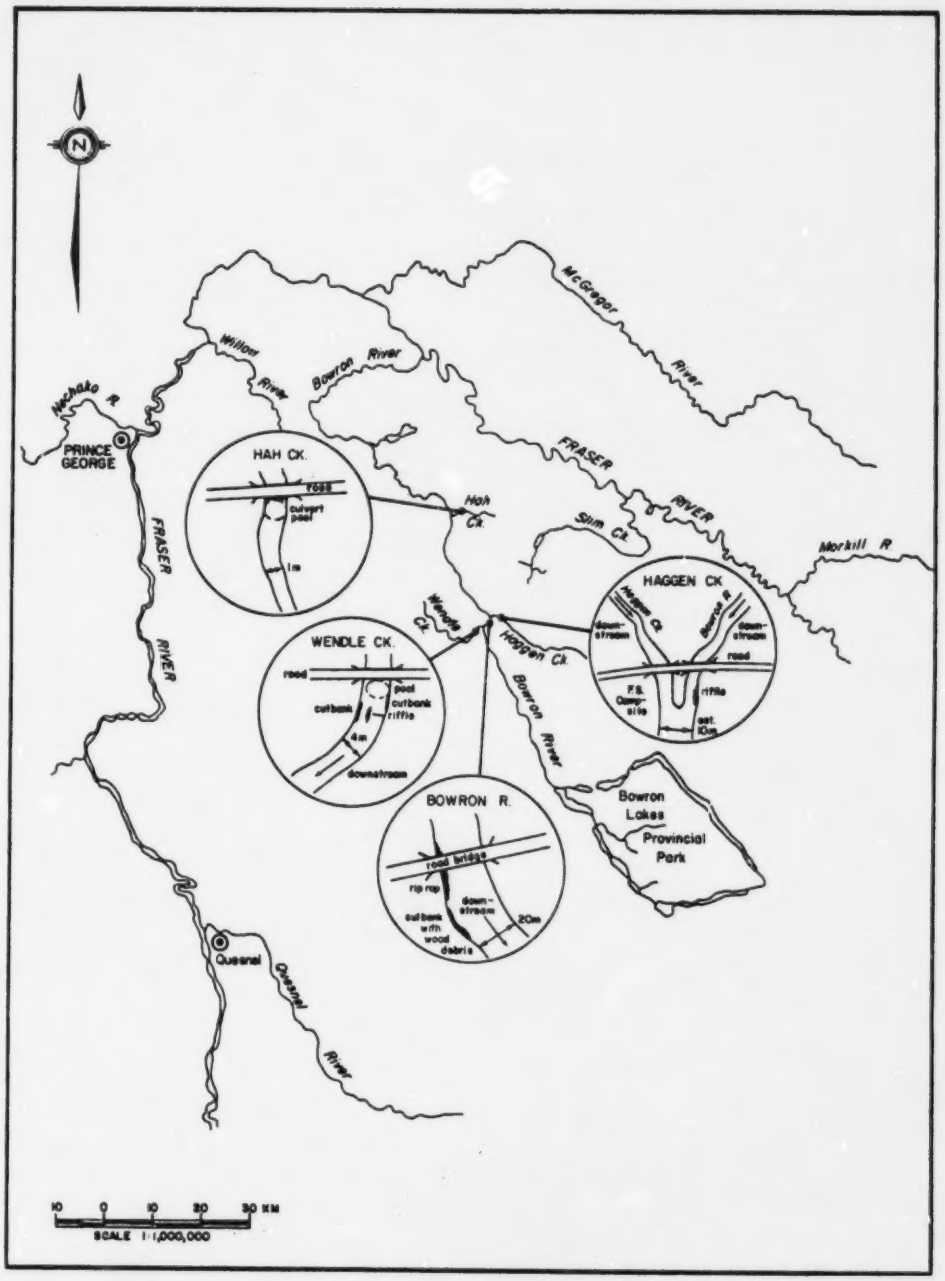

Fig. 6. Map of the Bowron River basin showing sites visited August 14, 1984.

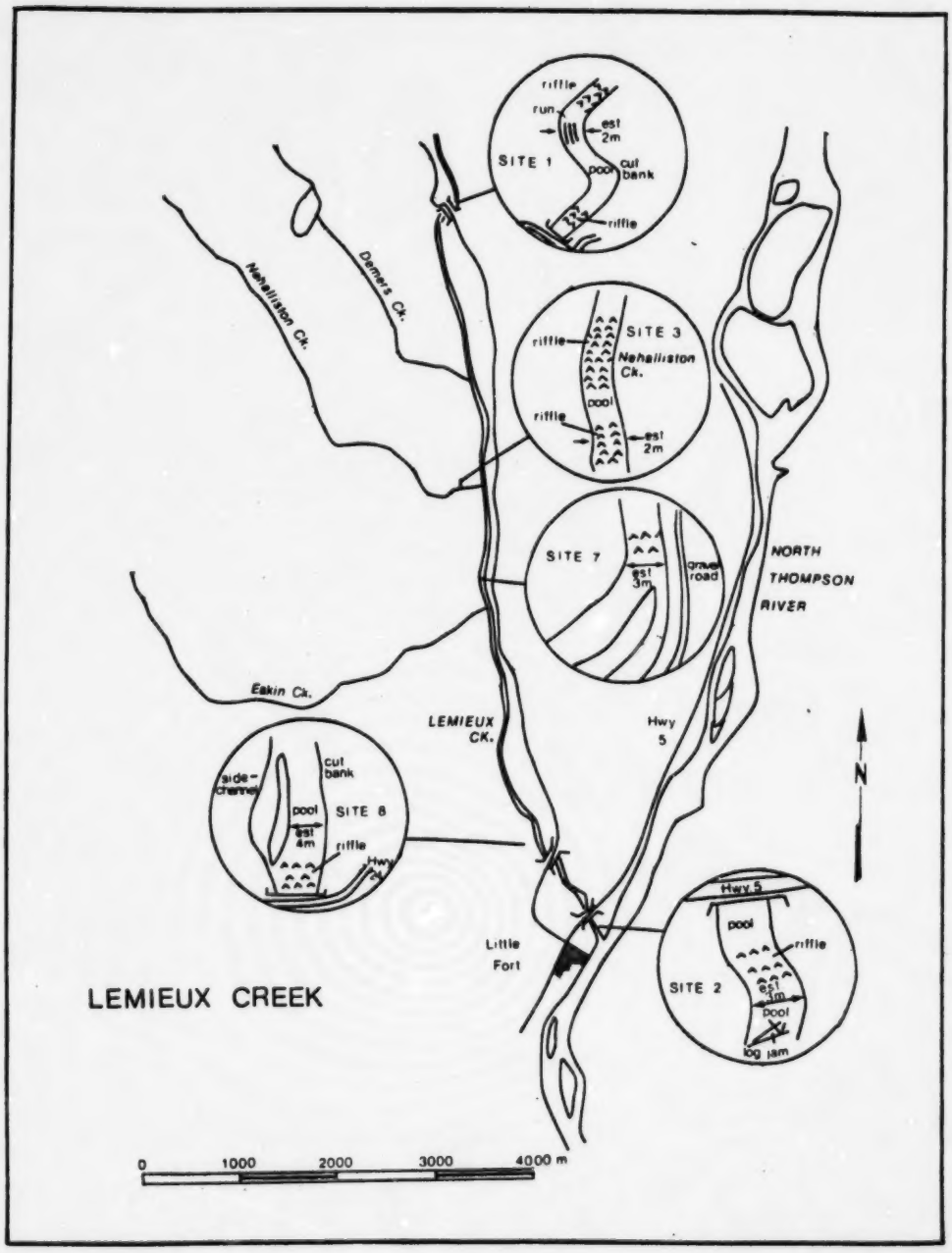

Fig. 7. Map of the Lemieux Creek drainage basin showing sites visited October 4 and 5, 1984.